

We claim:

- 1 1. An apparatus comprising:
2 at least one integrated peristaltic micropump for pumping fluid to be analyzed;
3 a plurality of integrated analysis chambers communicated to said plurality of
4 micropumps; and
5 a plurality of integrated analysis devices to test said fluid in said analysis
6 chambers for an analyte.
- 7 2. The apparatus of claim 1 where said plurality of micropumps pump said fluid into
8 said plurality of analysis chambers and flush said plurality of analysis chambers after
9 analysis of said analyte in said fluid.
- 10 3. The apparatus of claim 1 where said plurality of micropumps continuously pump
11 said fluid into said plurality of analysis chambers and continuously flush said plurality of
12 analysis chambers after analysis of said analyte in said fluid.
- 13 4. The apparatus of claim 1 where said analysis devices in said plurality of analysis
14 chambers comprise an integrated LED and an integrated optical detector.

1 5. The apparatus of claim 4 where said integrated LED and integrated optical
2 detector are tuned to an optical absorption line of said analyte.

1 6. The apparatus of claim 1 where said micropump comprises:
2 an electro-deformable membrane;
3 a substrate disposed below said membrane and coupled thereto, a microchannel
4 defined between said membrane and substrate, said microchannel having a longitudinal
5 axis; and
6 an electrode structure disposed on at least one side of said membrane along
7 side of said microchannel.

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1 7. The apparatus of claim 6 where said electro-deformable membrane is bowed to
2 form a curvature having a symmetrical axis in the direction of said longitudinal axis of
3 said microchannel.

1 8. The apparatus of claim 6 further comprising a drive circuit coupled to said
2 electrode structure to apply a sequential voltage along said plurality of opposing
3 electrodes to peristaltically deform said electro-deformable membrane in the direction of
4 said longitudinal axis of said microchannel.

1 9. The apparatus of claim 6 where said electro-deformable membrane is composed
2 of p-type GaN.

1 10. The apparatus of claim 7 where said electro-deformable membrane is composed
2 of p-type GaN.

1 11. The apparatus of claim 6 further comprising two opposing pillars disposed on
2 said substrate between said substrate and said membrane generally aligned in the
3 direction of said longitudinal axis.

1 12. The apparatus of claim 7 further comprising two opposing pillars disposed on
2 said substrate between said substrate and said membrane generally aligned in the
3 direction of said longitudinal axis.

1 13. The apparatus of claim 8 further comprising two opposing pillars disposed on
2 said substrate between said substrate and said membrane generally aligned in the
3 direction of said longitudinal axis.

1 14. The apparatus of claim 10 further comprising two opposing pillars disposed on
2 said substrate between said substrate and said membrane generally aligned in the
3 direction of said longitudinal axis.

1 15. The apparatus of claim 14 where said two opposing pillars are composed of n-
2 type GaN.

- 1 16. The apparatus of claim 6 where said electrode structure is comprised of two
2 opposing electrode substructures extending parallel to said microchannel.
- 1 17. The apparatus of claim 16 where said two opposing electrode substructures each
2 comprise a plurality of discrete electrodes arranged and configured to provide pairs of
3 opposing electrodes on each side of said microchannel.
- 1 18. The apparatus of claim 1 further comprising an integrated control circuit coupled
2 to said micropump, and analysis devices for control thereof.
- 1 19. The apparatus of claim 1 where said micropump, analysis chambers and
2 analysis devices are fabricated together during which a photochemical etching step is
3 used in the fabrication of said micropump while remaining portions of said apparatus are
4 masked.
- 1 20. A method of fabricating an apparatus of microanalysis of fluidic analytes
2 comprising:
3 fabricating a micropump composed of nitrides of B, Al, Ga, In, Tl or combinations
4 thereof using photoelectrochemical techniques, said micropump for pumping fluid to be
5 analyzed;
6 simultaneously fabricating a plurality of analysis chambers communicated to said
7 micropump; and

8 simultaneously fabricating a plurality of analysis devices to test said fluid in said
9 analysis chambers for an analyte during, said analysis devices being masked from said
10 photoelectrochemical techniques during fabrication of said micropump.